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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/941,125	08/28/2001	Gurtej Singh Sandhu	303.676US5	7117
21186	7590	10/16/2003		
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402				
			EXAMINER	
			SPERTY, ARDEN B	
			ART UNIT	PAPER NUMBER
			1775	

DATE MAILED: 10/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/941,125

Applicant(s)

SANDHU ET AL.

Examiner

Arden B. Sperty

Art Unit

1775

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 51-56,60-73,75,76 and 81-85 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 51,53-56,60-73,75,76 and 81-85 is/are rejected.
- 7) ☒ Claim(s) 52 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 16.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

FIRST OFFICE ACTION FOLLOWING RCE

1. Claims 51-56, 60-73, 75-76, 78, and 81-85 are currently pending.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 51, 53-56, 60, 62-66, 68-69 and 71-72 are rejected under 35 U.S.C. 102(b) as being anticipated by USPN 4,994,410 to Sun et al.

Regarding claims 51 and 53, the Sun reference teaches a via comprising a continuous layer of titanium 22 overlying the walls and an exposed base layer of a contact hole. The titanium layer is annealed to form a layer of TiN_xSi_y (titanium alloy) (column 3, lines 27-59, specifically lines 55-59 for the Ti alloy). The titanium alloy layer is coupled to a TiN barrier layer 26, and the barrier layer is coupled to a tungsten fill 27, 28 (col 4, lines 7-12, 35-41).

Regarding claim 54, the limitations of the claim are met by the TiN layer 26 (col 3, lines 47-49).

Regarding claims 55 and 56, the Sun reference teaches a via comprising a continuous layer of titanium 22 overlying the walls and an exposed base layer of a contact hole. The titanium layer is annealed to form a layer of TiN_xSi_y (titanium alloy) (column 3, lines 27-59, specifically lines 55-59 for the Ti alloy). The titanium alloy layer is coupled to a TiN barrier layer 26, and the barrier layer is coupled to a tungsten fill 27, 28 (col 4, lines 7-12, 35-41).

Regarding claim 60, the Sun reference teaches a via comprising a continuous layer of titanium 22 overlying the walls and an exposed base layer of a contact hole. The titanium layer is annealed to form a layer of TiN_xSi_y (titanium alloy) (column 3, lines 27-59, specifically lines 55-59 for the Ti alloy). The annealing step also forms a layer of titanium silicide 25 coupled to the titanium alloy layer (col 3, lines 44-49). A tungsten fill 27, 28 is coupled to the titanium alloy (col 4, lines 7-12, 35-41).

Regarding claim 62, the limitations of the claim are met by the TiN layer 26 (col 3, lines 47-49).

Regarding claims 63-65, the semiconductor substrate is silicon (col 3, lines 7-10) and Figures 3-5 show the first layer of titanium alloy coupled to the sidewalls and the second layer of titanium silicide 25 coupled to the exposed silicon substrate semiconductor surface.

Regarding claim 66, the Sun reference teaches a via comprising a continuous layer of titanium 22 overlying the walls and an exposed base layer of a high aspect ratio contact hole (see Figures 3-5). The titanium layer is annealed to form a layer of TiN_xSi_y (titanium alloy) (column 3, lines 27-59, specifically lines 55-59 for the Ti alloy). The annealing step also forms a layer of titanium silicide 25 coupled to the titanium alloy layer (col 3, lines 44-49). A tungsten fill 27, 28 is coupled to the titanium alloy (col 4, lines 7-12, 35-41).

Regarding claim 68, the limitations of the claim are met by the TiN layer 26 (col 3, lines 47-49).

Regarding claim 69, the Sun reference teaches the insulating layer 16 including BPSG (col 3, lines 21-24).

Regarding claims 71-72, the semiconductor substrate is silicon (col 3, lines 7-10) and Figures 3-5 show the first layer of titanium alloy coupled to the sidewalls and the second layer of titanium silicide 25 coupled to the exposed silicon substrate semiconductor surface.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 70 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sun as applied to claim 66 above, and further in view of USPN 5,970,309 to Ha et al.

6. The Sun reference teaches the structure of claim 70 including an insulating layer of an oxide, nitride, doped glass or other insulating material well-known in the semiconductor art. The reference further describes an embodiment where the insulating layer is BPSG (col 3, lines 16-24). The reference, however, is silent with respect to other specific well-known insulating materials. It would have been obvious to one of ordinary skill in the art to use silicon dioxide in place of BPSG because, as taught by Ha, BPSG and silicon dioxide are functionally equivalent insulating materials in the semiconductor art (Ha, col 3, lines 20-23).

Double Patenting

7. Claims 60, 61, 63-67, 69-73, 76-78, 81 and 84-85 of this application conflict with claims 48-50 and 60-80 of Application No. 09/940980. Although the claims are not identical due to the

claims of the instant application further containing limitations drawn to a fill of W or Al, it would have been obvious to one of ordinary skill in the art to put a fill of W or Al in the via because such a structure is notoriously well-known in the integrated circuit art (as evidenced by USPN 5924012 column 7, lines 63-65 and Fig. 1; USPN 6153490 column 10, lines 49-51 and Fig. 9i; USPN 5846881 col 2, lines 33-40 and Fig. 1; USPN 5444018 column 5, lines 59+; USPN 5644166 column 8, lines 30-34 and Fig. 8).

8. Claims 60, 61, 63-67, 69-73, 76-78, 81 and 84-85 of this application conflict with claims 44-45 and 60-83 of Application No. 09/940917. Although the claims are not identical due to the claims of the instant application further containing limitations drawn to a fill of W or Al, it would have been obvious to one of ordinary skill in the art to put a fill of W or Al in the via because such a structure is notoriously well-known in the integrated circuit art (as evidenced by USPN 5924012 column 7, lines 63-65 and Fig. 1; USPN 6153490 column 10, lines 49-51 and Fig. 9i; USPN 5846881 col 2, lines 33-40 and Fig. 1; USPN 5444018 column 5, lines 59+; USPN 5644166 column 8, lines 30-34 and Fig. 8). Although the claims are not identical due to the inclusion of specific integrated circuit structural limitations (semiconductor substrate, electronic device, insulating layer, active region) in the claims of Application No. 09/940917, the claims are not patentably distinct because they are drawn to the same subject matter and are merely using alternate language for describing a via or contact.

9. Claims 60, 61, 63-67, 69-73, 76-78, 81 and 84-85 of this application conflict with claims 46-47 and 57-82 of Application No. 09/941123. Although the claims of Application No. 09/941123 (except claim 58) are not identical due to the claims of the instant application further containing limitations drawn to a fill of W or Al, it would have been obvious to one of ordinary

skill in the art to put a fill of W or Al in the via because such a structure is notoriously well-known in the integrated circuit art (as evidenced by USPN 5924012 column 7, lines 63-65 and Fig. 1; USPN 6153490 column 10, lines 49-51 and Fig. 9i; USPN 5846881 col 2, lines 33-40 and Fig. 1; USPN 5444018 column 5, lines 59+; USPN 5644166 column 8, lines 30-34 and Fig. 8).

Although the claims are not identical due to the inclusion of specific memory device structural components (memory array, control circuit, I/O circuit) in the claims of Application No.

09/940917, the claims are not patentably distinct because they are drawn to the same subject matter and are merely using alternate language for describing a via or contact.

10. With respect to the Double Patenting rejections made herein, the following citations show that a memory, an integrated circuit, a contact and a via are obvious variants of each other and in the instant case are not patentably distinct: USPN 5924012 (column 1, lines 24-29, 41; column 3, lines 37-41; column 7, lines 43-48), and USPN 5846881 (column 1, lines 4-8), USPN 5444018 (col 1, lines 32-35).

11. 37 CFR 1.78(b) provides that when two or more applications filed by the same applicant contain conflicting claims, elimination of such claims from all but one application may be required in the absence of good and sufficient reason for their retention during pendency in more than one application. Applicant is required to either cancel the conflicting claims from all but one application or maintain a clear line of demarcation between the applications. See MPEP § 822.

Allowable Subject Matter

12. Claims 52, 61 and 67 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base

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claim and any intervening claims. Claims 73, 75-78 and 81-85 also contain allowable subject matter.

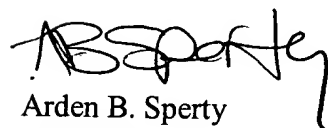
13. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record fails to teach or fairly suggest the claimed structure including a first layer of a titanium alloy comprising titanium and zinc.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arden B. Sperty whose telephone number is 703-305-3143. The examiner can normally be reached on M-R, 08:00-16:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on 703-308-3822. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Arden B. Sperty
Examiner
Art Unit 1775


DEBORAH JONES
SUPERVISORY PATENT EXAMINER

September 30, 2003